



**BTR**

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# BTR

## IMMUNE MEDIATED BTR

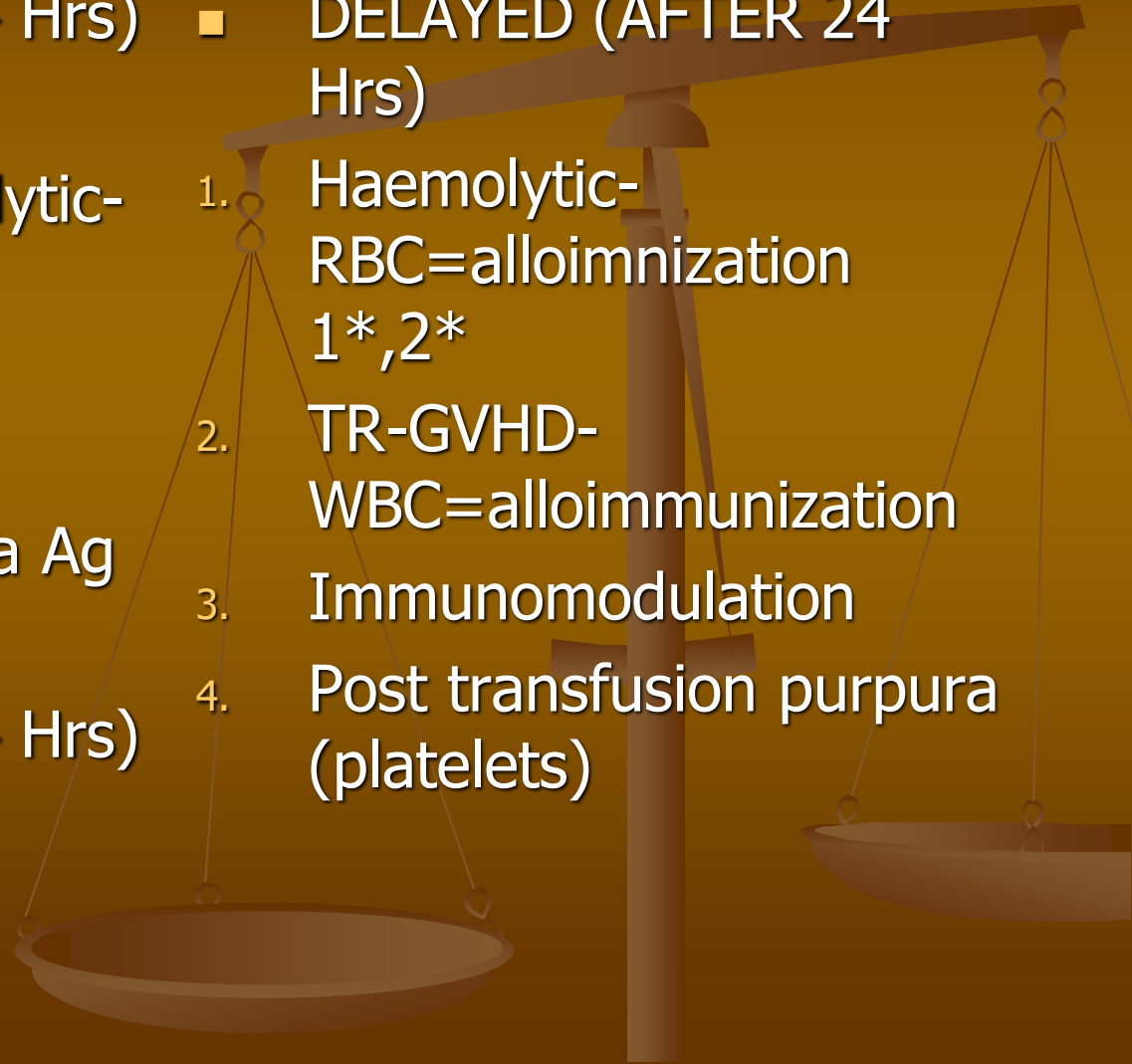
- ACUTE (WITHIN 24 Hrs)

1. Haemolytic-RBC
2. Febrile non haemolytic-WBC
3. TRALI-WBC
4. Allergic-plasma Ag
5. Anaphylactic-plasma Ag

- ACUTE (WITHIN 24 Hrs)

- DELAYED (AFTER 24 Hrs)

1. Haemolytic-RBC=alloimmunization  
1\*,2\*
2. TR-GVHD-WBC=alloimmunization
3. Immunomodulation
4. Post transfusion purpura (platelets)



# BTR

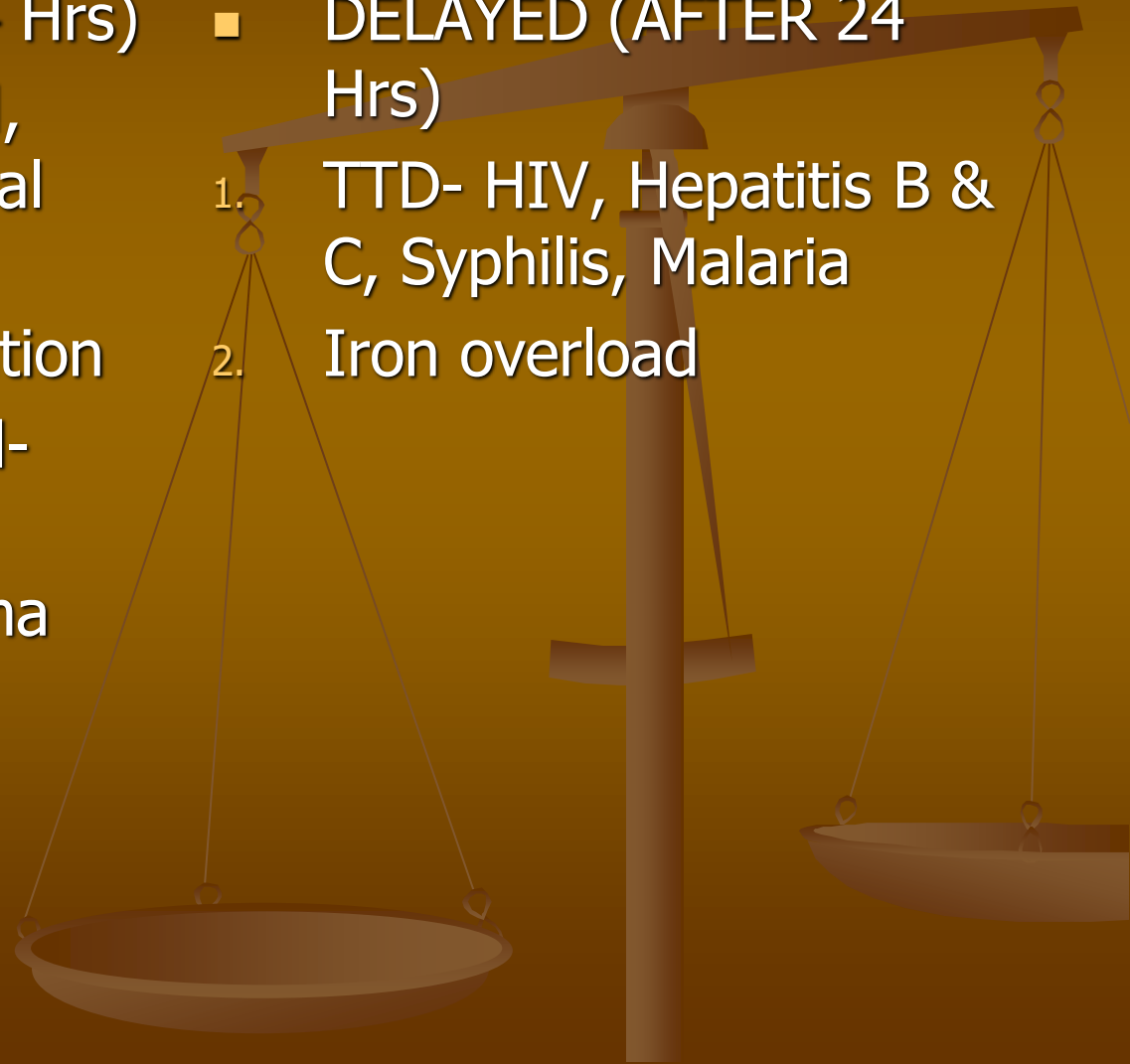
## NON-IMMUNE MEDIATED BTR

### ■ ACUTE (WITHIN 24 Hrs)

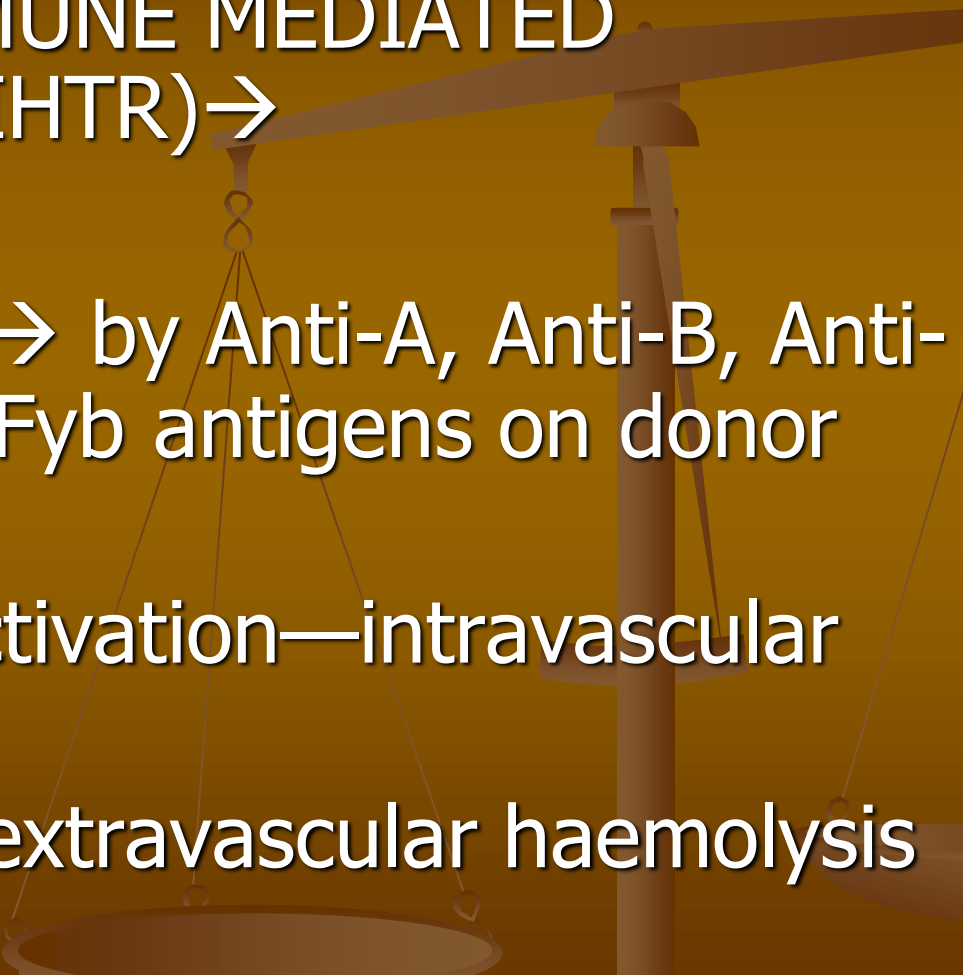
1. Haemolytic-physical, chemical, mechanical damage
2. Bacterial contamination
3. Circulatory overload-plasma
4. Hyperkalemia-plasma

### ■ DELAYED (AFTER 24 Hrs)

1. TTD- HIV, Hepatitis B & C, Syphilis, Malaria
2. Iron overload



# HAEMOLYTIC BLOOD TRANSFUSION REACTION

- IMMEDIATE IMMUNE MEDIATED HAEMOLYTIC (IIHTR) →
    - PATHOGENESIS → by Anti-A, Anti-B, Anti-kell, Anti-Jka, A-Fyb antigens on donor RBC →
      1. complement activation—intravascular haemolysis.
      2. opsonization—extravascular haemolysis by RE cells.
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# IMMEDIATE IMMUNE MEDIATED HAEMOLYTIC (IIHTR)

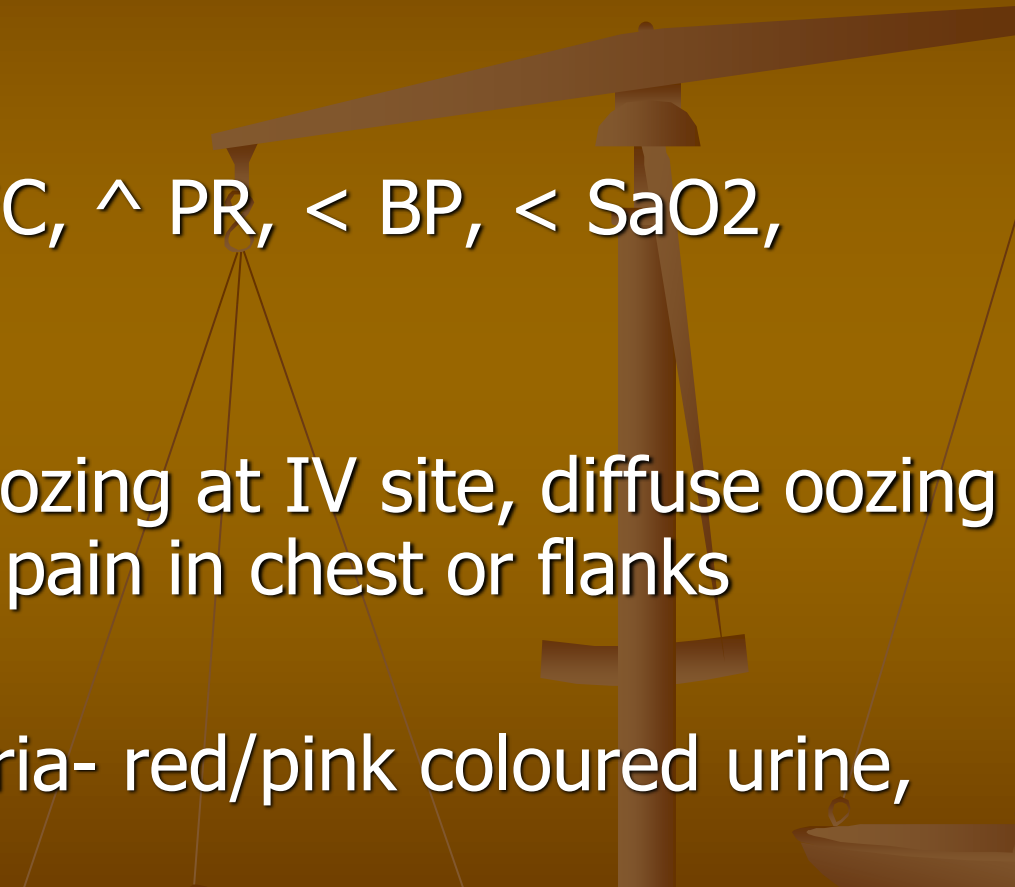
## ▪ CLERICAL CAUSES- IMPROPER

- Identification of pt while sample collection
- Labeling of pt sample
- Data entry
- Labeling of blood bag
- While CM
- Labeling/issue form
- Identification of pt at BT

## ▪ TECHNICAL ERROR

- Error in BG, CM
- Faulty Sera or CM technique
- Weak Ab can't be detected by saline CM
- Incorrect interpretation of CM result
- Minor incompatibility- Destruction of recipient RBCs by donor Abs

# IMMEDIATE IMMUNE MEDIATED HAEMOLYTIC (IIHTR)

- S/S →
  - G/E →  $\uparrow T > 1^{\circ}-2^{\circ}C$ ,  $\uparrow PR$ ,  $< BP$ ,  $< SaO_2$ ,  
Dyspnoea
  - LOCAL → Pain or oozing at IV site, diffuse oozing from surgical site, pain in chest or flanks
  - SYSTEMIC → Hb uria- red/pink coloured urine, oliguria, anuria.
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# IMMEDIATE NON- IMMUNE MEDIATED HAEMOLYTIC (NIHTR)

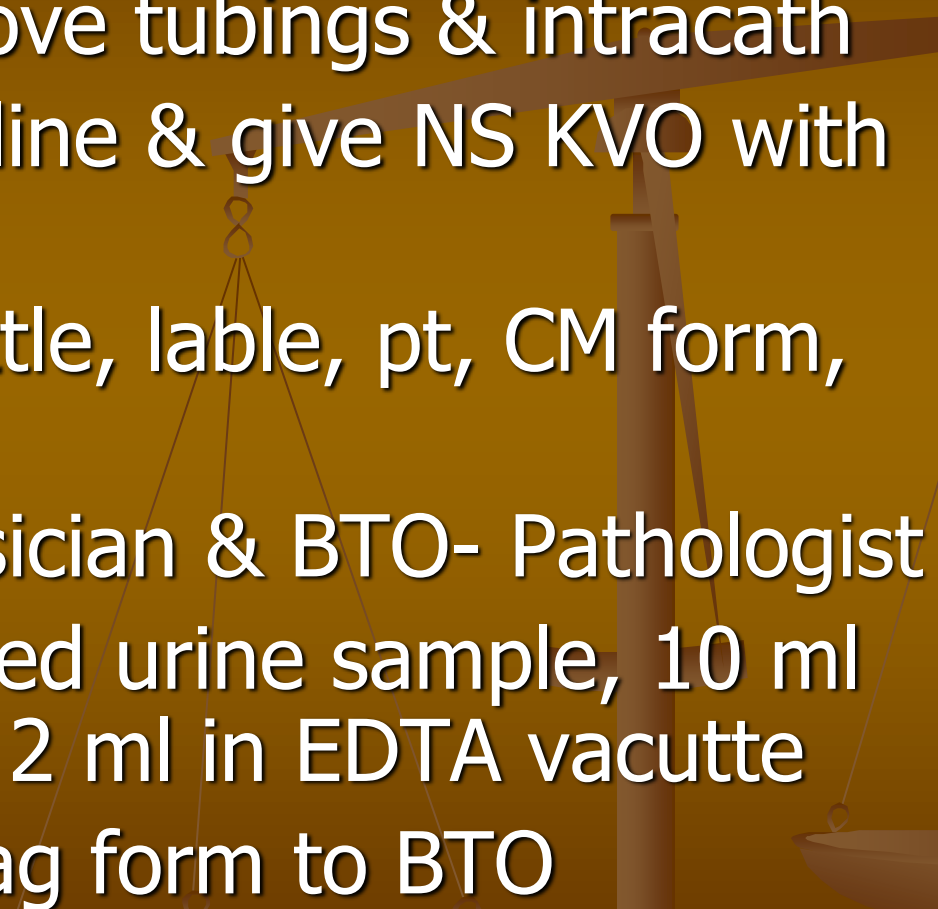
## ■ CAUSES→

- PHYSICAL DAMAGE TO RBC→ if stored at  $<3^*$  or  $>42^*$  c temp, thermal damage.
- CHEMICAL→ If BT mixed with Hypotonic saline, 5%D, drugs or pints/ iv set soiled with drugs or other fluids
- MECHANICAL→ BT given by small bore needle, use of blood/ roller pump during cardiac surgery.
- BIOLOGICAL→ Bacterial contamination of blood

# IMMEDIATE NON- IMMUNE MEDIATED HAEMOLYTIC (NIHTR)

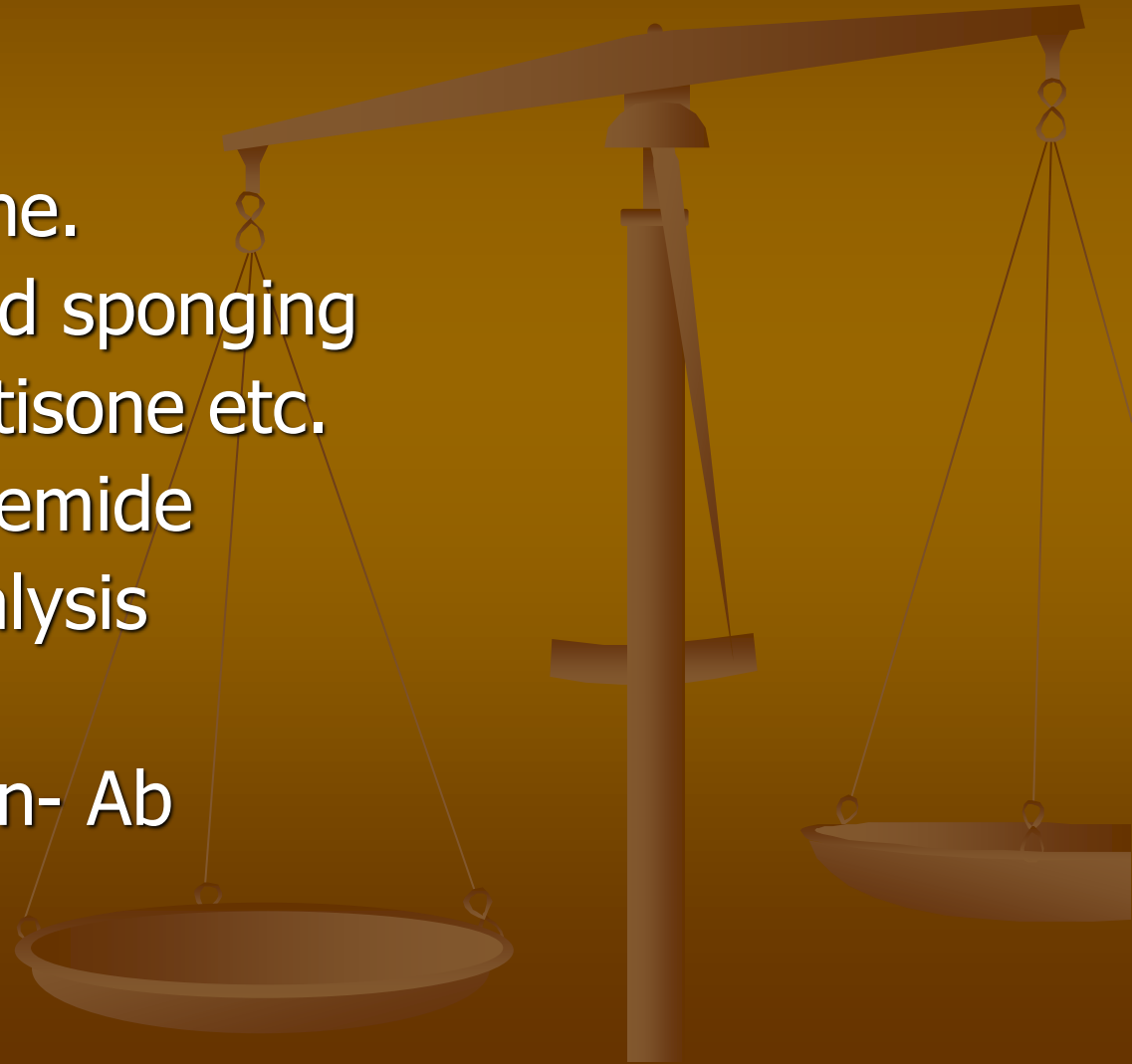
- S/S OF TRANSFUSION OF HAEMOLYZED UNIT →
  - G/E →  $\uparrow T > 1^{\circ} - 2^{\circ}C$  ( fever with chills & rigors ), dryness & flushing of skin,  $\uparrow PR$ ,  $< BP$ ,  $< SaO_2$ , Dyspnoea
  - SYSTEMIC → Muscle pain, vomiting, abdominal pain, Hb uria- red/pink coloured urine, oliguria, anuria, DIC
- PREVENTION → Look for haemolysis, blood clots or colour change in blood bag.
  - Haemolysed unit- purple colour in both bag & attached tubing.
  - Bacterial contamination- only bag colour change.

## Mx OF IMMEDIATE HAEMOLYTIC BTR

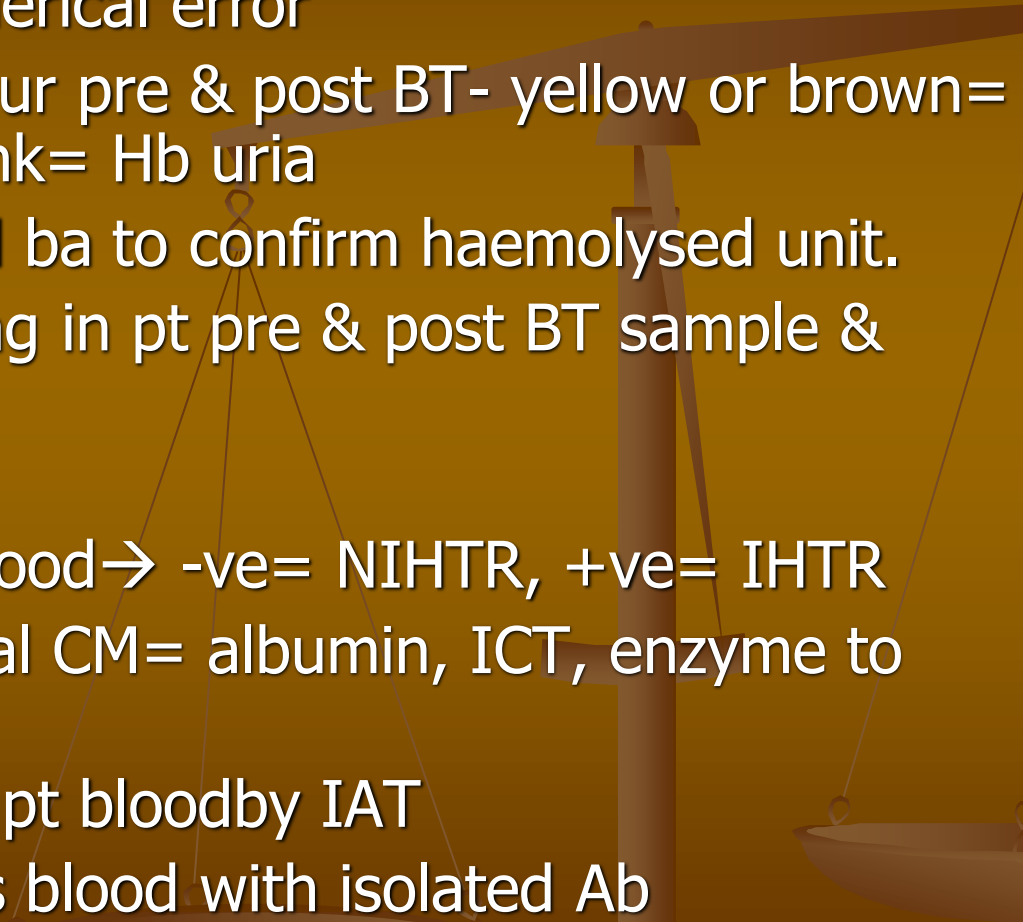
- Stop BT & remove tubings & intracath
  - Secure other iv line & give NS KVO with new iv set
  - Check blood bottle, lable, pt, CM form, data book
  - Inform pt's physician & BTO- Pathologist
  - Collect first voided urine sample, 10 ml blood in plain & 2 ml in EDTA vacutte
  - Send sample, bag form to BTO
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# Mx OF IMMEDIATE HAEMOLYTIC BTR

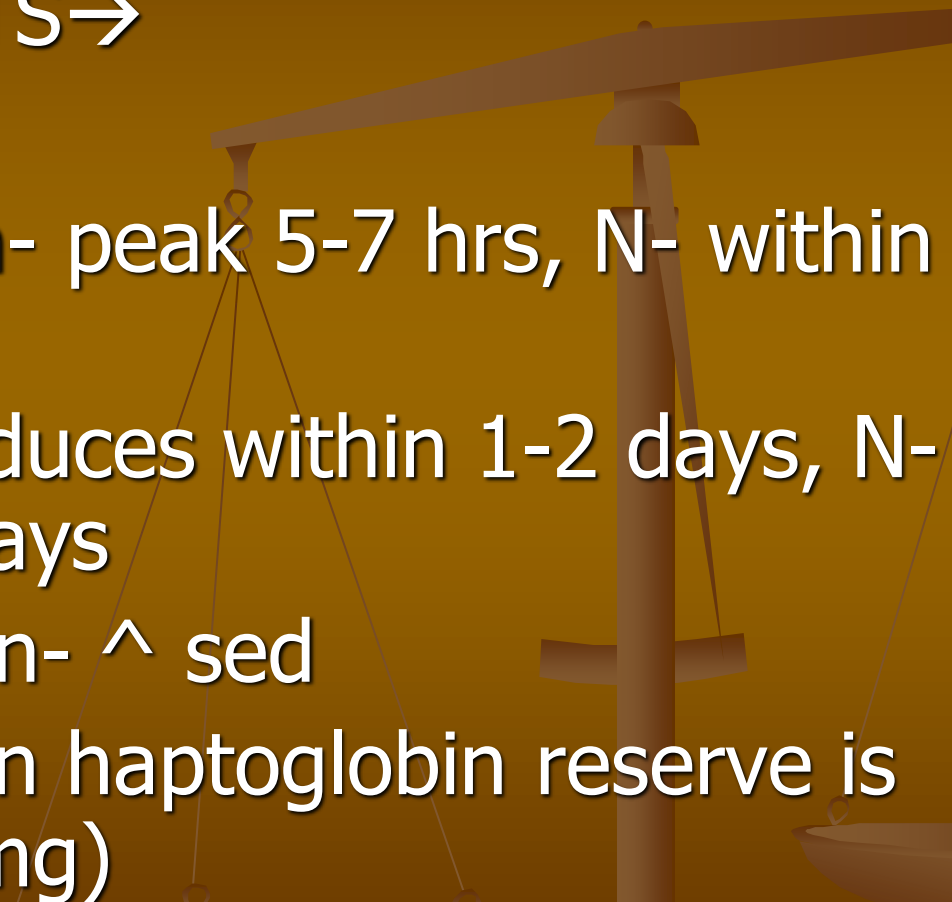
- Rx→
  - ABC- NS, Dopamine.
  - Antipyretics, tappid sponging
  - IV CPM, Hydrocortisone etc.
  - Renal failure- frusemide
  - Hyperkalemia- Dialysis
  - DIC- FFP
  - Bact contamination- Ab



# LAB Ix OF IMMEDIATE HAEMOLYTIC BTR

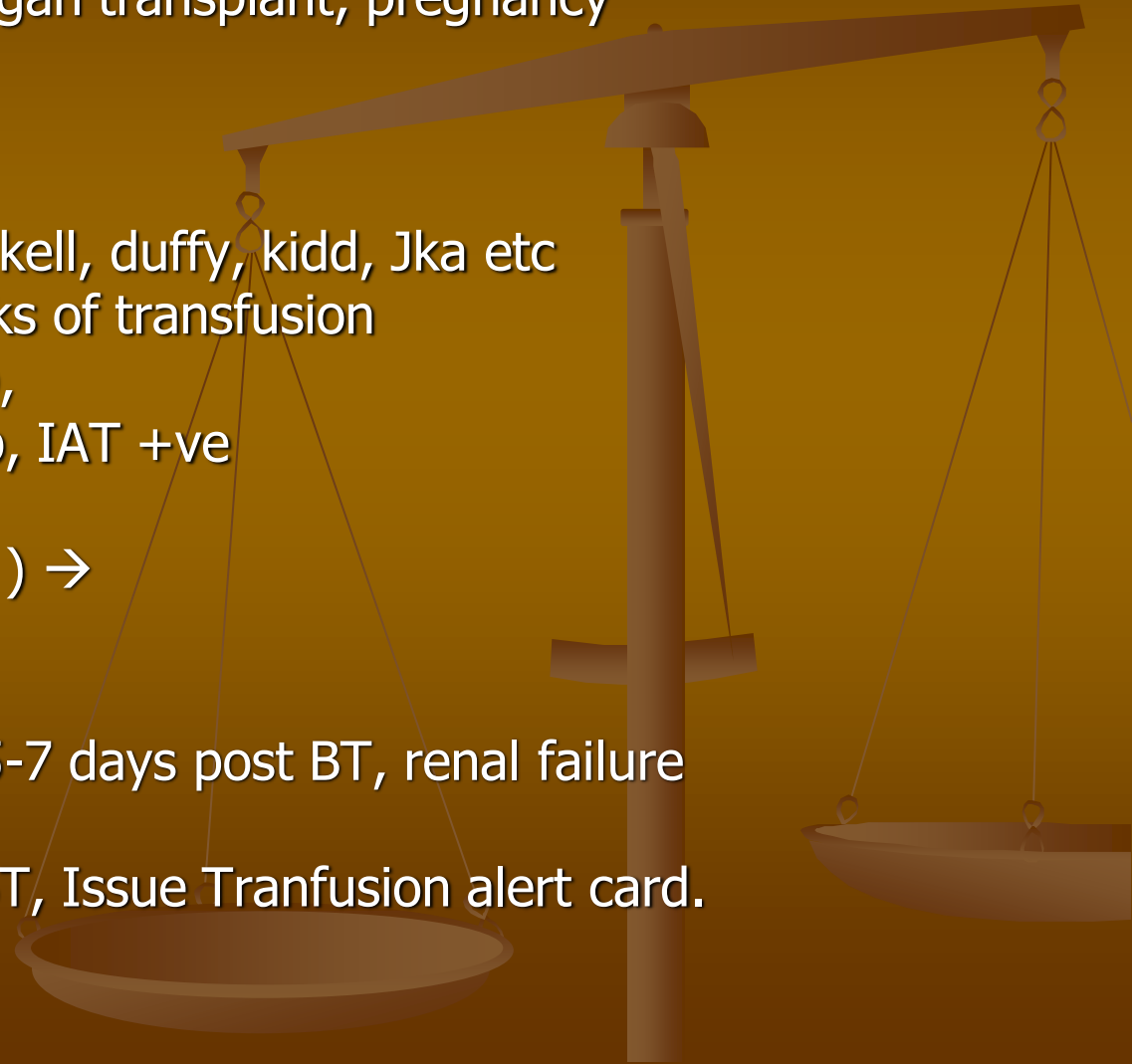
- CHECK DATA → For clerical error
  - Compare plasma colour pre & post BT- yellow or brown= bilirubinemia, red/ pink= Hb uria
  - Check colour of blood ba to confirm haemolysed unit.
  - Repeat ABO-Rh testing in pt pre & post BT sample & blood bag
  - Repeat saline CM
  - Perform DCT on pt blood → -ve= NIHTR, +ve= IHTR
  - If DCT +ve- do special CM= albumin, ICT, enzyme to detect weak Ag
  - Identify Ab pannel in pt blood by IAT
  - Identify Ag on donors blood with isolated Ab
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# LAB Ix OF IMMEDIATE HAEMOLYTIC BTR

- OPTIONAL TESTS →
  - Indirect bilirubin- peak 5-7 hrs, N- within 24 hrs
  - Haptoglobin- reduces within 1-2 days, N- within several days
  - Methaemalbumin- ^ sed
  - Free Hb- ^ when haptoglobin reserve is used (N-10-40 mg)
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# DELAYED HAEMOLYTIC BTR

- ❖ CAUSE- Previous BT, Organ transplant, pregnancy
- ❖ TYPES
  - 1\* →
    - Ab produced against Rh, kell, duffy, kidd, Jka etc
    - Occurs after several weeks of transfusion
    - S/S- mild fever, fall in Hb,
    - Ix- DAT +ve, irregular Ab, IAT +ve
  - 2\* ( anamnestic reaction ) →
    - Cause – same
    - Rapid, more sever
    - < Hb, > bilirubin within 5-7 days post BT, renal failure
- ❖ Mx→ Give weak Ag CM BT, Issue Tranfusion alert card.



# NON HAEMOLYTIC BTR

## ❖ TRALI→

PATHOGENESIS→ Anti leukocyte Abs in donor/ recipient plasma→ Ag-Ab cx in pulm cap→Histamine, complement, PG activation

S/S→ fever withj chills, dyspnoea, cyanosis, resp distress

Ix→ X- ray chest- bilat pulm infiltrate persist for 24-48 hrs

Rx→ ABC, IV STEROID, ANTIHISTAMINICS

## ❖ FNHTR→

PATHOGENESIS→ Cytokines from WBCs or Ab against WBCs– Ag-Ab reaction– cytokine release

S/S→ Fever > 1\* c ( with chills & rigors ) of pt baseline without any explainable cause within 24 hrs of BT, ^ PR, < BP, cough, dyspnoea, cyanosis

Ix→ leukopenia

Rx→ Antipyretics, antihistaminics, LR-Blood

# NON HAEMOLYTIC BTR

## ❖ ALLERGY→

PATHOPHYSIOLOGY→ IgE resins in recipient plasma react with allergens in donor plasma→ mast cell, basophil activation→ histamine release→ inflammatory mediators

S/S→ urticaria, itching, laryngeal oedema, fever

Rx→ Antihistaminics, corticosteroids, prophylactic antihistaminics, saline washed RBCs

## ❖ ANAPHYLAXIS→

PATHOPHYSIOLOGY→ IgA deficient recipients (1 in 700-800, but % of them have circulating anti-IgA antibodies), previous transfusion, preg, organ transplant

S/S→

Skin- urticaria, flushing, fever. RS- dyspnoea, cough, bronchospasm

CVS- hypotension, syncope, arrhythmia. GIT- nausea, vomiting, diarrhoea

Rx→ antihistaminics, steroids, epinephrine 0.5 ml 1:1000, use of plasma reduced components/ IgA deficient plasma donor

# NON HAEMOLYTIC BTR

## ❖ CIRCULATORY OVERLOAD→

PATHOG→ large amount of whole blood or plasma, fast BT, specifically to anaemic or cardiac pts

S/S→ CCF, pulm oedema= dyspnoea, cough, cyanosis, ^ PR, <BP

Rx→ stop BT, upright position, O<sub>2</sub>, diuretics, cardiotonics if required

PREVENTION→ BT infusion rate should be 1 ml/kg/min, should not be completed in <4 hrs, IV frusemide given before BT

❖ IRON OVERLOAD→ 1 unit of BT contains 200 mg iron, so multi tranfused pts develop haemosiderosis- liver, heart, glands

## ❖ HYPERKALEMIA→

P- Stored blood, some amount of haemolysis,

S- vomitting, muscle cramps, bradycardia, cardiac arrest.

Rx- ABC, 5%D insulin drip, NaHCo<sub>3</sub> inj, Ca Co<sub>3</sub> inj if required

## ❖ IMMUNOMODULATION

## ❖ TRANFUSION TRANSMITTED DISEASES

# NON HAEMOLYTIC BTR

- ❖ GVHD → Donors functional lymphocytes engraft and multiply in immuno compromised recipient's marrow. Fatal in 84% within 21 days

CAUSES → congenital immunodef, AIDS, BM suppression, intrauterine foetal BT, newborn exchange BT, haematologic or oncologic malignancy, BT from blood relatives

S/S → fever, rash, diarrhoea, hepatitis, BM suppression, infections

Rx → steroids, cyclosporin, methotrexate

PREVENTION → irradiated blood components

- ❖ POST TRANSFUSION PURPURA →

P-anamnestic reaction to PIaI Ag

S- fever, chills, dyspnoea, < plat count 1 wk after BT

Rx-steroid, Plasmapheresis, IV Ig